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## Scoping e-portfolios to engineering and ICT education

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### Abstract

E-portfolios are progressively becoming a key means for students to integrate their learning across the entire length of their program. However, the application of e-portfolios in engineering and ICT programs has been generally isolated to a few courses in each program, if at all. This paper summarises the use of e-portfolios to document student learning. Other aspects of the paper include the need for connections to curriculum mapping tools, e-portfolio software platforms, integration of outcomes through the curriculum, professional placements in industry, final year projects, etc.

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*Keywords:* e-portfolio; standards; accreditation; program learning outcomes; competencies.

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### 1. Introduction

The delivery of higher education has been facing enormous changes and challenges over the last two decades with the progressive introduction of various educational technologies and tools that have affected all aspects of traditional teaching and learning [1, 2]. In this changing environment, engaging students is a difficult task faced by all academics [3-5]. Student engagement can be defined as a “student’s willingness, need, desire and compulsion to participate in, and be successful in, the learning process” [6, 7]. Electronic Portfolio or e-Portfolios may be used as a vehicle for addressing many problems including current assessment practices [8]. The use of e-Portfolio can enhance assessment and feedback and reflective learning especially where module-based exam assessments do not enable to provide feedback due to restricted access to exam scripts [6]. An e-Portfolio is defined as a portfolio of digital

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collection of individual and group demonstrations, resources, and accomplishments, team work, etc. via online or offline. An e-Portfolio contains 3 main sections: a) a storage area to store and / or archive evidence or artifacts, b) a reflection area which can be shared with others for public comments/ feedback, and c) a presentation or public area where one can present himself/herself to different people for different purposes. The electronic evidence may include stored text, files, images, audio/video clips, blog entries, twitter and social media texts, and various web links. The e-Portfolio is generally planned, developed and compiled by the owner. Usually there are 3 main categories of information broadly compiled in e-Portfolios: a) Personal Details - personal information, personal values and interests, personal activities – volunteer work, professional development, hobbies and interests, personal reflections, etc., b) Academic Records - education history, subject related matters such as assignment, projects, papers, etc., academic staff comments, peer comments, learning reflections, etc., and c) Career - goals and plans, work history, curriculum vitae/resume, awards and certificates, reflective manager comments and/ or peer comments, etc. In higher education, students prepare the e-Portfolios and the academic staff member assesses it. E-Portfolio is a kind of actual evidence of learning process and learning achievement. E-Portfolio allows sharing the information with other making it a powerful tool in personal and professional development.

## 2. E-Portfolios in higher education

There are at least three types of e-Portfolios are widely used. They are: a) home-grown (institution specific), b) open source (institute and/ companies developed), and c) commercial. E-portfolios can also be sub-grouped based on their features and purposes such as a) developmental portfolios, b) assessment portfolios, and showcase portfolios as shown in Table 1.

**Developmental Portfolio** - it demonstrates the advancement and development of student's skills over a period of time. It is considered works-in-progress and includes both self-assessment and reflection/feedback elements. The main objective of this portfolio is to provide communication between students and academic staff.

**Assessment Portfolio** - it shows student's competence and skill for particular and specialised areas. This portfolio can be used for ongoing and/or end of subject/course and program assessment for assessing student performance. The primary aim of this type of portfolio is to examine student competency as outlined by the course/subject and program learning outcomes and standards.

**Showcase Portfolio** – it illustrates student's skills and work examples. Usually, the showcase portfolio is created at end of a course/subject and /or program to show the quality of student's work. This portfolio can be used by the student to his/her potential employers to gain employment at the end of a program.

Now a day, most e-Portfolios are hybrid types encompassing features of developmental, assessment and showcase portfolios.

Table 1. E-Portfolio types based on features and purposes (adapted from <http://scu.edu.au/teachinglearning/index.php/79>).

Types of e-Portfolios	Features	Purposes
Developmental (learning, reflection, formative, work in progress)	<ul style="list-style-type: none"> <li>Focus on the learning 'process' and work in progress</li> <li>Features self-assessment, formative feedback and reflection</li> </ul>	<ul style="list-style-type: none"> <li>Formative feedback on learning</li> <li>Develop communication and reflective skills</li> </ul>
Showcase (professional, formal, presentation, career, employment)	<ul style="list-style-type: none"> <li>Focuses on the 'product'</li> <li>Features exemplary work and skills</li> <li>Illustrates and evidences experience /achievements</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate quality of work and achievements</li> <li>Showcase skills to employers/clients</li> </ul>
Assessment (summative formal assessment)	<ul style="list-style-type: none"> <li>Evidence of competency or accreditation standards</li> </ul>	<ul style="list-style-type: none"> <li>Evaluate competency and achievements against criteria or standards</li> </ul>
Institutional (also called planning, continuous professional development, or academic e-Portfolios).	<ul style="list-style-type: none"> <li>Reflection on professional progress</li> <li>Professional development planning</li> <li>records achievements, plans and non-professional activities</li> </ul>	<ul style="list-style-type: none"> <li>Document ongoing professional learning</li> </ul>

Some widely cited e-Portfolio platforms are: a) Desire2Learn, b) Digication, c) E-scape, d) Educa, e) Elgg, f) Equal Electronic Portfolio, g) Foliotek, h) LiveText, i) Mahara, j) MAPS, k) OpenSchool ePortfolio, l) Passport, m) Pathbrite, n) PebblePad, o) RCampus, p) Taskstream.

However, Mahara, PebblePad and Foliotek are widely used in higher education. In Australia, RMIT University, La Trobe University, Charles Sturt University, Flinders University, Murdoch University, University of Sydney, University of Tasmania, Bond University, James Cook University, Edith Cowan University, University of Western Sydney, and Victoria University are using PebblePad platform as e-Portfolio. In addition, Australian Library and Information Association, the Australian Physiotherapy Association, Technical and Further Education (TAFE) of South Australia, Ranges TEC, and Royal District Nursing Service of South Australia also use PebblePad e-Portfolio for their members [9]. In New Zealand, the Wellington Institute of Technology and Osteopathic Council of New Zealand are the user of PebblePad e-Portfolio platform.

The utilisation of e-portfolios by students in their learning offers numerous benefits. E-Portfolios enable students to explore and take decision on their learning and prepare themselves for the future. The e-Portfolio assists in developing ongoing, evidence-based learning and performance assessment throughout a course/subject and/or a program. Some important advantages that an e-Portfolio can offer are:

- Space for feedback that can be used for performance improvement and saved for future use;
- Initiative to be self-directed and responsible for student's own learning and assessment;
- Opportunity to make connections between tacit knowledge and constructed knowledge;
- track students' accomplishments and feedback over a sustained period, through on going assessment;
- Digital literacy skills development;
- Communication skills specially for international students;

An e-Portfolio should have four important features: a) flexible structure, b) opportunities for self-reflection, c) support for career development, and d) reflection and feedback on learning

### 3. E-Portfolios at RMIT University

RMIT is currently using PebblePad as an e-Portfolio tool. PebblePad is a web-based e-Portfolio system which allows students to store, package and present their learning, goals and achievements for different purposes (assessment, personal, career development, etc.). Various features and tools in PebblePad platform are illustrated in Figure 1.

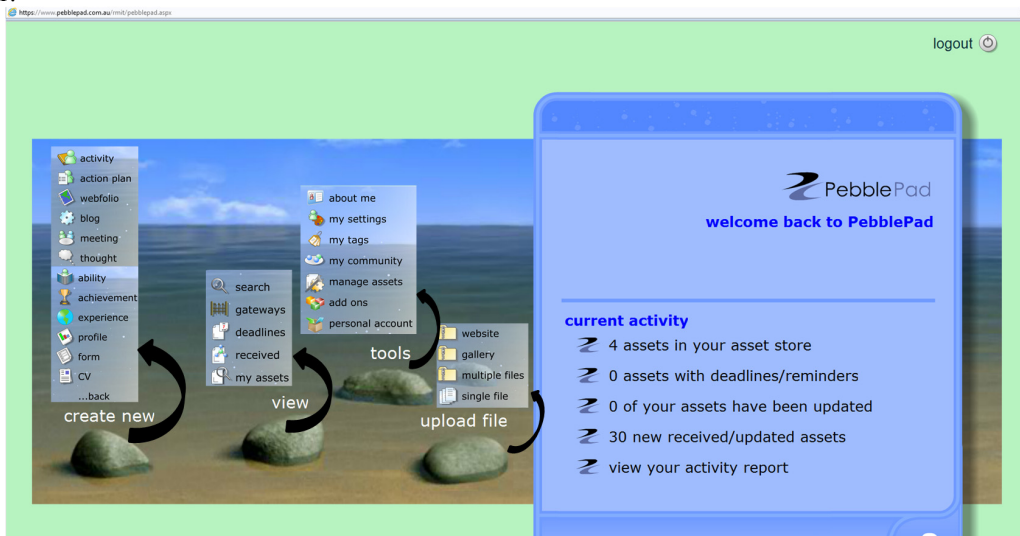


Fig. 1. PebblePad input features.

PebblePad provides a Personal Learning Space. It is a web based program that offers a number of different tools to plan work, organise evidence of learning and record and reflect on learning. PebblePad has two main sections: a) Pebble+ and b) ATLAS as shown in Figure 2. Pebble+ area is a private area where one can create and store assets and learning contents whereas ATLAS area is for assessment space where one can submit selected assets for assessment, grading and feedback. PebblePad space is password protected, all the work students undertake are their own and confidential. When students are ready to publish an asset they can send it to a workspace that allows their lecturer(s) or peers to view and comment on their work.

Students from different programs and schools across RMIT University can use PebblePad as e-Portfolio tool. All students in the School of Aerospace, Mechanical and Manufacturing Engineering of RMIT University have access to a PebblePad account whilst they are enrolled in their final year research project course at the University. PebblePad has many uses but at RMIT University its primary purpose is to collect and create evidence of students learning in the form of journals, blogs, web-folios, photos, documents, media files, industry work experience report, minutes of weekly meeting between final year project supervisor(s) and students, and links to external web sites from Pebble+. Students can then use the different types of evidence to creatively build assets in Pebble+ and submit these as assessment tasks to ATLAS as per the instruction of the lecturer and/or course guides as shown in Figure 2. These students' assets can be shared with prospective employers and other external parties.



Fig. 2. Work areas in PebblePad (adapted from [10]).

E-Portfolios are excellent tools for showing the development of students' skills and abilities in both formal and informal contexts. The evidence of these skills (course or subject matter skills, communication skills, team work skills, professional practice skills, etc.) can be used for the career development and employment. To enhance employability of graduates, RMIT University has developed a Career Track for students to incorporate their CVs and individual career planning in e-Portfolio that can be linked to PebblePad and similar platforms. Fig. 3 shows an e-portfolio platform that can be used for individual student's career development profile at RMIT University.



Fig. 3. Career development using e-portfolio ([www.rmit.edu.au](http://www.rmit.edu.au)).

#### 4. Challenges in e-Portfolio utilisation

In order to utilise the full potential of e-Portfolios in higher education especially in engineering and ICT, both students and academic staff members need to overcome many challenges including: i) investment of time by both students and academic staff, ii) technical proficiency of students and academic staff, and iii) development of students ability for critical reflection and selection of work for assessment. In e-Portfolios, both students and academic staff are required to engage in individual and collaborative activities and cultivate interactive culture.

##### 4.1. Challenges for students

The challenges for students in utilisation of e-Portfolios in their learning are mainly the anticipated additional time and workload. Students need additional assistance to develop e-Portfolio platform/software user skills, technical (subject matter) skills, and skills of selection, collection, and reflecting on learning materials. Students may also need advice on appropriate use of a typical e-Portfolio environment and space. They also need to have access to internet during their study time so that they can login into the e-Portfolio platform uninterrupted which is considered to be a challenge due to occasional system outages and site maintenance.

##### 4.2. Challenges for academic staff

The challenge for academic staff in e-Portfolio uses is mainly the modification time and effort required to the traditional assessment practices for an individual course or subject. These modifications of assessment practice for e-Portfolios are time consuming and required additional skills including computer skills for variable class size (large class and small). The assessments are subjective and the modification may compromise assessment reliability due to use of incorrect assessment rubrics and marking schemes. Academic staff needs careful consideration in assessing e-Portfolio as it takes time for students to become familiar with the e-Portfolio idea. The process of collecting, selecting and reflecting on learning materials possesses a great challenge too. Another challenge for academic staff is to provide feedback to students on time as the late assessment of student's e-Portfolios in the course/subject can jeopardise students learning outcomes.

## 5. Discussion and future strategy

In order to achieve a sustained impact, e-Portfolios should be used by higher education institutions especially engineering and technology focussed institutions, academic staff, students, professional accreditation bodies so that students can effectively use throughout their programs (study) and for job applications and leading into e-chartered, review of e-portfolio extracts by accreditation panels and use of e-portfolio extracts by employers. Therefore future strategy should be on e-Portfolios that incorporate ‘assessment equivalence of qualifications and learning outcomes’, ‘assessment and promotion of learning’ and ‘employability skills’. The following features of a typical e-Portfolio should be included for the wider use:

- Flexibility so that professional competencies and skills requirements can be added for the information age with convenient many-to many tagging
- User capability by students throughout their programmes and afterwards
- Inter-operability of e-portfolios i.e. facility to carry the e-portfolio after graduation and throughout a career
- Easy connection to professional organisations especially engineering accreditation bodies
- Support system for reflective practice
- Facility to link to assessment
- Modelled use and demonstrated value by academics
- Capability for peer mentor development
- Ability for industry-based mentor development
- Capacity for extracting a standardised portfolio for employment opportunity

By integrating all above mentioned dot point features, an e-Portfolio across a program can be a means to support widening participation of traditional and non-traditional students/learners of all teaching modes (face to face, distance and hybrid), international students, distance learners, and learners who are work-based or engaged in continuous professional development. As the number of student mix (local and international) in higher education especially in engineering is constantly increasing, managing diverse cohorts and teaching large groups have become a challenge for academic staff member. The utilisation of e-Portfolios can overcome this challenge. In order to enhance employability skills as well as professional accreditation of an academic program, e-Portfolios can be used to map competencies across the curriculum and students’ attainment against these competencies. E-portfolios can also be used to keep transparent records for learning pathways, credit transfers, and multiple modes of participation and assessment. In the long run, the use of e-Portfolios can mitigate current challenges in higher education especially in engineering if a common e-portfolio platform can be used by universities, accreditation bodies, and work placements (industry employers).

## References

- [1] Alam, F., Hadgraft, R. and Alam, Q. (2014), eLearning – Challenges and Opportunities, in: *Using Technology Tools to Innovate Assessment, Reporting, and Teaching Practices in Engineering Education*, (ed. Alam F), IGI Global, New York.
- [2] Alam, F., Alam, Q., Chowdhury, H. and Steiner, T. (2013), *Transnational Education: Benefits, Threats and Challenges*, *Procedia Engineering*, Vol. 56: 870-874.
- [3] Harper, S. R., and Quaye, S. J. (2009). *Student engagement in higher education: Theoretical perspectives and practical approaches for diverse populations*. London, UK: Routledge.
- [4] Heafner, T. (2004), Using technology to motivate students to learn social studies. *Contemporary Issues in Technology and Teacher Education*, 4(1). Retrieved from <http://www.citejournal.org/vol4/iss1/socialstudies/article1.cfm> on 27 October 2014.
- [5] Trowler, V. (2010), *Student engagement literature review*. York, UK: Higher Education Academy.
- [6] O’Keeffe, M. and Donnelly, R. (2013), Exploration of ePortfolios for Adding Value and Deepening Student Learning in Contemporary Higher Education, *International Journal of ePortfolio*, Vol. 3 (1): 1-11
- [7] Bomia, L., Beluzo, L., Demeester, D., Elander, K., Johnson, M., and Sheldon, B. (1997), *The impact of teaching strategies on intrinsic motivation*. Champaign, IL: ERIC Clearinghouse on Elementary and Early Childhood Education.
- [8] Chatham-Carpenter, A., Seawel, L., and Raschig, J. (2010), Avoiding the pitfalls: Current practices and recommendations for ePortfolios in higher education, *Journal of Educational Technology Systems*, Vol. 38(4): 437-456.
- [9] Australasian PebblePad User Group: <https://www.pebblepad.com.au/australia/viewasset.aspx?oid=16412&type=webfolio>, accessed on 27 October 2014.
- [10] La Trobe University, e-portfolio: [http://tlweb.latrobe.edu.au/education/ICTtools/pebblepad/PebblePad\\_010.html](http://tlweb.latrobe.edu.au/education/ICTtools/pebblepad/PebblePad_010.html).